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middle of the ray. Length, 36–38 μ; diameter with rays, 68–72 μ; without, 16–18 μ; isthmus, 12 μ.

Type in Herb. Johnson, 276. Bridgeport, Conn.

A single specimen was found having five rays on one end of the semi-cell. All the others were typical.

BOTANICAL LABORATORY, UNIVERSITY OF MICHIGAN.

Explanation of Plate 211.

(Reduced one-fourth in photographing.)

a, front view of cell; b, vertical view; c, side view.

1. Xanthidium antilopasum (Breb.) Kutz., var. Minneapoliense Wolle, forma. ×560.
2. Staurastrum leptocladum Nordst. ×560.
3. " " var. cornutum Wille. ×560.
4. St. gyrans n. sp. ×770.
5. Cosmarium cyclicum Lund. ×560.
6. C. impressulum Elfv. ×770.
7. C. subglobosum Nordst. ×770.
8. Euastrum binale Ralfs. var. insulare Wittr. ×770.
9. St. bicoronatum n. sp. ×1150.
10. St. irregulare West. ×1150.
11. C. sulcatum Nordst. ×560.
12. C. nudiceps n. sp. ×560.
13. C. calcareum Wittr. ×770.
14. C. angulare n. sp. ×770.
15. Onychonema leve var. micracanthum Nordst. ×770.
16. St. elegantissimum n. sp. ×560.
17. C. tessellatum (Delp.) Nordst. ×560.

Recent Discoveries of Cycadean Trunks in the Potomac Formation of Maryland.

BY LESTER F. WARD.

Scarcely any fact is better known to palæontologists than that of the discovery by Philip T. Tyson, in 1859, of two large cycadean trunks and some other fragments in the iron ore region of Maryland. These were not described at the time, and were only briefly mentioned in his first report as State Agricultural Chemist, published in January, 1860 (p. 42), where he refers to them as "A new genus of a Cycas, of large dimensions, which will be described on another occasion." In immediate connection with this he also mentions "silicified coniferous wood," and "lignites (coniferous)." These he says were found in the "Iron Ore Clays (No. 22 in the illustrations)," and in the accompanying map he indicates the position of the Iron Ore Clays. The exact locality at which these trunks were found is not stated in Tyson's report, but Professor Uhler in the Transactions of the Maryland Academy of Sciences for 1888 (**1**: 7–8) says that "one specimen came from the iron ore beds of Mr. J. D. Latchford, near Muirkirk, a second from the vicinity of Hyattsville, and a third from similar clays next the shore of the Patapsco river at the Spring Gardens, south of Baltimore." From information in his possession Professor Uhler has also informed me of the discovery of apparently another specimen near Beltsville, on the property of Mr. Emack; also of a small fragment on the property of Dr. J. D. Jenkins, near Muirkirk. Professor Uhler has also mentioned to me the occurrence of still another specimen in the vicinity of Baltimore, which he was at the time negotiating for, but had not yet secured. These facts seem to constitute all the information in the possession of the scientific world relative to the occurrence of cycadean trunks in the State of Maryland down to the year 1893.

The description promised by Tyson never appeared, but a photograph of one of these specimens was made by him and distributed to the leading geologists of this country and Europe, a copy of which has recently come into my possession. Sir William Dawson, to whom a photograph was sent, showed it to Mr. William Carruthers, who mentioned it in a postscript to his important memoir "On Fossil Cycadean Stems from the Secondary Rocks of Britain,"* and says: "It is obviously a species of *Bennettites*, with smaller leaf-scars than those in *B. Saxbyanus*."

In his Flora of the Potomac Formation,"† Prof. Wm. M. Fontaine describes four specimens, consisting of two trunks and two fragments. From what he says of the localities (pp. 188, 193), they are evidently the same that have already been mentioned, although the precise language used in describing these localities is somewhat different from that given by Professor Uhler. Professor Fontaine, in his laudable desire to do the maximum honor to the original discoverer, created a new genus of these forms and called them *Tysonia Marylandica.* As it turns out he would have accomplished his object much better had he given Tyson's name to the species instead of to the genus, since the latter cannot stand, as these forms obviously belong to the genus Cycadeoidea of Buckland, which was indeed recognized by Professor Fontaine, when, in a paper to the American Journal of Science,* in 1879, he used the name "*Cycadoidea*" in referring to these very specimens. At the same time, by the laws of nomenclature now so rigidly enforced, the species cannot be changed, and the name of Tyson drops out entirely.

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* Trans. Linn. Soc. **26**: 708, 1870.

† Monographs of the U. S. Geol. Survey, **15**: 186–193, *pl. clxxiv.–clxxx.*, 1889.

The object of the present paper is to record the recent discovery and collection by Mr. Arthur Bibbins, Curator of the Museum of the Woman's College, Baltimore, of no less than thirty-five additional specimens of cycadean trunks and parts of trunks from the same general region as that in which Tyson's specimens were obtained. This I regard as one of the most important events in the history of palæontology in America, as it brings together such a body of facts relative to the cycadean vegetation of the Lower Cretaceous in Maryland that it will now be possible to give something like a complete history of that type of plants.

The specimens are all good, many of them extraordinarily fine. Nearly half of them are so complete that they may correctly be called trunks, and show nearly or quite all that was ever present; although often much distorted by pressure, and more or less flattened either laterally or vertically. Many of the remaining fragments show fully half the trunk, and have the advantage of exposing, on the broken side, the inner parts, the medullary axis, woody zones, and sections through the cortical portions. In several cases the scars produced by the separation of the medullary axis from the outer parts are very distinctly shown, and in one specimen we have a true *Cycadomyelon*, to the side of which the exterior portion of the trunk is attached for some distance, thus demonstrating for the first time the true nature of *Cycadomyelon.* In a number of the specimens the "crow's nest" is distinctly seen, but in several cases there is in the center of this crow's nest a prominent boss, symmetrical in form and conical in shape, which appears to be the terminal bud, which was petrified entire after it had been developed at the apex of the trunk.

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* III., 17: 157.

It is fitting for many reasons that this event be made known to the scientific public. It is not necessary, of course, to dwell upon its scientific importance, but not only should the great service which Mr. Bibbins and the Woman's College have rendered to palæobotany be publicly recognized, but the manner and method by which this result has been accomplished should be set forth as an example of what a correct method is capable of accomplishing, and as a hint to others who may be engaged in similar lines of research.

The collection is primarily the result of the policy of the Woman's College in seeking to supply its students with scientific material to work upon. The Woman's College is a young institution founded some six years ago, but it is one which is rapidly coming to the front and cannot fail to take a place among the first of its class in the country. Its president and founder, Dr. John F. Goucher, to whose efforts its success is so largely due, is a man who possesses all the qualifications for the position he holds. The standard which he has set up is that of the highest excellence, and visitors to that college have only to look around to see that nothing has been left undone to place it in the front rank of institutions for the higher education of women. Its scientific departments are strong, being largely officered by graduates of Johns Hopkins and other leading universities. A museum has been established in connection with the scientific instruction, and an effort is being made to equip it with everything necessary for the successful study of nature, and Dr. Goucher does not believe, as so many seem to do, that nothing has value in a museum which has not been brought from some remote region.

In appointing Mr. Bibbins curator of the college the right step has been taken to further these ends. A post-graduate of Johns Hopkins at the time of his appointment, Mr. Bibbins has been trained to the best scientific work. He is naturally endowed in a high degree with true scientific instincts as well as with practical judgment and good sense. It is these qualities which have led him to adopt an entirely new method in searching for scientific material. Knowing the rarity of fossil cycadean trunks and their great value to science, he set himself the task of trying to secure some of these for the college museum. But, instead of undertaking a hopeless and aimless quest, as has been done by geologists and collectors in the past, he chose to avail himself of the knowledge of the inhabitants of the districts in which the cycads were believed to occur. Supported by the Woman's College, which furnished him the means of transportation and met the small expense of his work, including an occasional *pour boire* to some needy farmer or miner who possessed information of great value, and usually gave it freely, he proceeded to visit the houses of the native population, and placing himself on a level with their powers of understanding, he was able to interrogate a large number of persons in such a way that they could not fail to comprehend his meaning. Having secured one specimen, he carried it about in his wagon and showed it to all whom he met. His surprise was great to find that a large proportion of the inhabitants of the iron ore districts had at some time in their lives seen similar things and were able to recognize them. In some cases a person to whom he would show his specimen would reply at once that there was such a stone in his barnyard or near his house, and by a very little negotiation he was able easily to secure it. By far the greater number, in fact nearly all, of the specimens were thus found in the possession of the people. Many of them could remember having ploughed them out of their fields, or taken them from their ore pits; others there were that had lain so long around farm houses whose occupants had several times changed that it was impossible to trace them to their original source, but usually even in such cases there was a tradition lingering in the family with regard to the peculiar stones. The reason why they were so universally picked up and brought to the house or the workshop or the barnyard or laid up in some conspicuous place seems to be that their peculiarity was instantly recognized. A countryman knows every stone that he has seen about his place, and if there be one which differs markedly from all others, especially if it has a certain symmetry of form or shows unusual and regular markings, he at once distinguishes it, is impressed by its appearance, and probably, at first at least, couples with the notion of its strangeness some vague idea of its possible utility or money value. He therefore invariably picks it up and sequestrates it in some way. After many years, finding that there is no demand for it, that no one knows any use to which it can be put, he eventually loses interest in it, and it is pushed aside, forgotten, and perhaps covered up in some obscure corner. So that in addition to the specimens that Mr. Bibbins actually obtained, there remain quite a number which are known to exist, but which for the present cannot be found.

Mr. Bibbins always frames his questions with skill, taking care not to ask leading ones, realizing that the desire to please is liable to color the answer and make it conform to what it is supposed he desires to have said. He therefore always takes pains to induce these people to tell what they know independently of any suggestion on his part.

As an illustration of the accuracy with which such persons often observe and remember facts, may be mentioned a case in which one of these traditional lost specimens was being inquired after from an octogenarian who remembered seeing it some forty years before, and when asked if the "holes" in the stone were "round" he replied, "No, they were sort o' three-cornered," a remark which rendered it certain that the object was really a cycad.

When, in January last, I learned that this collection was being made, I immediately commenced making inquiries in regard to it. I was much interested in the subject from two points of view: first, in the hope of settling the question of the exact geological position of these remains; and secondly, in the hope that an opportunity might be secured of studying this collection in connection with that of a similar one from the Black Hills of South Dakota, which had been obtained by the National Museum, and upon which I was then engaged. My efforts were met in a liberal spirit, both by President Goucher and Mr. Bibbins, and the general result has been that the entire collection has been loaned to the National Museum and placed in my hands to be described and illustrated in a memoir which is now in preparation on the Fossil Cycadean Trunks of North America, in which it is expected that nearly or quite every specimen known from any part of the United States will be included. Prof. F. H. Knowlton will be associated with me in the publication of this memoir, and to him will be entrusted the important subject of their internal structure.

With regard to the first of the two above-named objects which I had in view, I may mention that the Woman's College has afforded me the much-prized opportunity of spending a week in the field with Mr. Bibbins in visiting all the localities at which the trunks have been found. In most cases, as already remarked, they were found by Mr. Bibbins at different places from those in which they had been first discovered, but there was always some quite definite knowledge to be obtained as to the original localities. These were themselves, it is true, often little calculated to throw light on their geological position, the earliest history in many cases not going back of a time when they were seen in some field or by the roadside in the country. I may here say in anticipation of what will be said in the general report now in preparation for publication by the Geological Survey on the geology of the Potomac formation, that in the course of the last five or six years, during which time I have been more or less actively engaged in the study of that formation, I have been able with some success to subdivide it into no less than six somewhat distinct horizons, and it was therefore directly germane to my investigations that the horizon to which the cycads belong should be fixed with certainty. Tyson, as has been seen, reported that they were found in the iron ore clays, and it has been the general belief ever since that this was their position. I had observed that the large quantities of silicified wood and most of the lignites that occur in this formation come from a much lower horizon, viz., that of the Fredericksburg freestone, which in Maryland is never hardened into rock, but exists in the form of loose sand and gravel, as indeed it does to a large extent in Virginia. Having found silicified wood immediately associated with the cycadean trunks of the Black Hills, and having also learned that it occurs in the same beds in which Professor Cragin found a similar specimen in Southern Kansas, I had suspected the possibility that the same would prove to be the case in Maryland, a view which Professor Fontaine had held for some time, but we had been unable to find any cycads in place. It is a significant fact that in the photographic view made by Tyson large pieces of petrified wood stand side by side with the cycadean trunk, and, as already stated, he says that this occurs in the same beds. Although it proved very difficult to locate those of Maryland, still, in consequence of the very large number that have been found, it was possible, by the ordinary application of geologic reasoning, to trace these with greater or less certainty to their original position. There is only one case in which the exact spot was pointed out to us at which a specimen had been seen firmly adhering to and projecting from an original exposure. This was circumstantially described to us by a man who was undoubtedly altogether worthy of belief, and who, moreover, could have had no object in coloring the facts. He placed his hand on the spot where he had seen the stone projecting for many years, and stated that it subsequently fell out and rolled down into the bottom of a deep gulch, where it lay for a number of years longer, being carried with each season's freshet further and further down the gulch. At last his curiosity led him to pick it up and take it to his house, where Mr. Bibbins obtained it. If this information is reliable, which there is no reason to doubt, this specimen, at least, originally occurred in the "paint stone," which I have ascertained to belong to the same horizon as that of all the silicified wood. There are several other cases in which the position of the specimens could scarcely have been different from that of this one under any of the ordinary processes by which they were carried to the places where they were found, and there is not a single case which negatives the possibility of a similar origin. I regard the conclusion as altogether reliable that all the fossil cycadean trunks of Maryland were primarily entombed in the sandy deposits underlying the iron ore clays.*

Taking these facts in connection with the general flora of that horizon, so abundantly developed in certain parts of Virginia, we are in position to form a somewhat correct idea of the nature of the vegetation that then occupied the region along that important line upon which the cities of New York, Philadelphia, Wilmington, Baltimore, Washington, Fredericksburg, Richmond, Petersburg and Weldon—or from the Hudson to the Roanoke—are situated to-day. Leaving out of account the abundant herbaceous vegetation which carpeted the ground and filled the swamps and marshes, the general picture arises in the mind of a great Sequoian forest, furnishing the silicified wood, in the midst of which, corresponding to the shrubby undergrowth of modern forests, were everywhere to be seen these short cycadean forms from six inches to two feet in diameter and rising from a few inches to several feet above ground, crowned at their summits by tufts of large palm-like or fern-like leaves, of striking aspect and great beauty.

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* This refers to the so-called "brown ore" only. The "white ore" is found in the dark, carbonaceous clays below the paint stone.

There is quite a remarkable parallelism between the history of the discovery of these cycadean forms in Maryland with that which has recently been so graphically characterized by Senator Capellini in a monograph published jointly by him and Count Solms-Laubach on the Cycadean Trunks of the Italian Museums.*

The historical part of this memoir, written by Senator Capellini, has all the interest of a romance, and he enters into a minute description of the mode of occurrence, the original discovery, and the final disposition of the large number of objects of this class which have been found in Italy and have made their way to the several museums of that country. The literature itself dates back to 1745, while many of the specimens have been known for a much longer period. And some of these, though recently discovered, were found, like those of Maryland, in places where they had been placed at a very early date. One of them was found in a wall of great antiquity in the city of Verona, and another was taken from the top of a tomb in the ancient Etruscan Necropolis of Marzabotto, where it had been placed by the remote ancestors of the modern Italian race, either as an ornament, or in commemoration of some symbolic rite. Thus does the history of science repeat itself, and the new chapter, which has just been opened, is not the least interesting one of that history.

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*I tronchi di Bennettitee dei musei Italiani. Notizie storiche, geologiche, botaniche, dei Professori Senatore G. Capellini e Conte E. Solms-Laubach. Mem. Real. Accad. Sci. Ist. Bologna (V.), 161–215, *pl. 1–5*.